

Application No. 09/904,704

REMARKS

The above-identified patent application has been reviewed in light of the Examiner's Action dated September 21, 2005. Claims 1, 4, 5, 10, 15, 16, 20 and 21 have been amended, and Claims 2, 14 and 19 have been cancelled without intending to abandon or to dedicate to the public any patentable subject matter. Accordingly, Claims 1, 3-13, 15-18 and 20-21 are now pending. As set out more fully below, reconsideration and withdrawal of the rejections of the Claims are respectfully requested.

The Claimed invention is generally directed to improved RAID 1 write performance in low cost systems. In particular, embodiments of the Claimed invention are capable of writing a primary copy of data and a mirror copy of data on a pair of devices comprising a RAID 1 array substantially simultaneously. Embodiments of the Claimed invention also allow for the substantially simultaneous retrieval of data from the storage devices in normal operation, and the operation of a multiplexer such that data retrieved from a first one of the storage devices is provided to the transport master, and such that data retrieval from a second one of the storage devices is not provided to the transport master. Further embodiments of the Claimed invention provide for the operation of a multiplexer such that in a failover operating mode, data retrieved from a second one of the storage devices is provided to the transport master, and such that any data read from the first storage device is not provided to the transport master. As set forth in greater detail elsewhere herein, the references cited in the Office Action do not teach, suggest or disclose each and every element of the Claims. Therefore, reconsideration and withdrawal of the rejections of the Claims are respectfully requested.

Claims 1, 2, and 6-8 stand rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent No. 6,389,493 to Barkley et al. ("Barkley"), in view of U.S. Patent No. 6,813,688 to Wu et al. ("Wu"). In addition, Claims 16-21 stand rejected as being unpatentable over U.S. Patent No. 6,801,954 to Rust et al. ("Rust") in view of Wu. Finally, Claims 3-5 and 9-15 stand rejected under 35 USC §103 as being unpatentable over Barkley in view of Rust. In order to establish a prima facie case of obviousness under §103, there must be some suggestion or motivation to modify the reference or to combine the reference teachings, there must be reasonable expectation of success, and the prior art reference or references must teach or suggest all the claim limitations. (MPEP §2143.)

Application No. 09/904,704

However, each and every element of these claims cannot be found in the cited references. Accordingly, reconsideration and withdrawal of the rejections of the claims as obvious are respectfully requested.

The Barkley reference is generally directed to a system and method for dynamically allocating bandwidth to a plurality of slave cards coupled to a bus. More particularly, Barkley discusses a bus management system in which a master card coupled to the bus controls the amount of bus bandwidth that is allocated to slave cards also interconnected to the bus. (Barkley, Abstract.) According to Barkley, rather than providing a fixed distribution of bus bandwidth to the slave cards, the master card is capable of dynamically allocating bandwidth to the slave cards in order to accommodate the changing needs of the slave cards. (Barkley, col. 1, ll. 36-39.) However, there is no description in Barkley of providing first data addressed to a transport master to the transport master and to a transport slave at substantially the same time, or providing the first data to a first storage device interface from the transport master and to a second storage device interface from the transport slave at substantially the same time. Furthermore, the portion of Barkley cited for disclosing receiving data addressed to the transport master at the transport master and at the transport slave substantially simultaneously (Barkley, col. 1, ll. 55-67 and col. 2, ll. 1-3) discusses communications between a communication module of the master card and slave cards over the bus, according to the allocated bandwidth. There is no disclosure in Barkley of operations by a transport master and a transport slave that are performed substantially simultaneously with respect to first data.

In addition, there is no disclosure in Barkley of selectively interconnecting storage devices to a transport master using a multiplexer.

The Wu reference is generally directed to a system and method for efficient data mirroring in a pair of storage devices. In particular, Wu discusses the provision of mirroring logic that allows data to be written to a pair of storage devices simultaneously. (Wu col. 6, lines 60-66.) However, Wu does not discuss a system or method that allows for selectively interconnecting one of two storage devices to a transport master in connection with the retrieval of data. More particularly, Wu does not discuss the use of a multiplexer in connection with selectively interconnecting one of two

Application No. 09/904,704

storage devices to a host via a transport master such that only data read from one of the storage devices is passed to the host via the transport master.

The Rust reference is generally directed to a method and apparatus to concurrently operate on multiple data movement transactions in a disk array subsystem. More particularly, Rust discusses a disk array controller that has two identical controller boards to enhance reliability by providing continuous backup and redundancy in the event that one controller becomes inoperable. (Rust, col. 4, ll. 21-26.) The controllers 54a and 54b are each interconnected to a disk array 50 with multiple storage disks 52. (Rust, col. 4, ll. 8-10 and 20-23; Fig. 2.) However, there is no description in Rust of selectively interconnecting storage devices to a transport master using a multiplexer.

Claim 1 is generally directed to a method for controlling data transfer between a host and a plurality of storage devices. As amended, Claim 1 recites providing a request for one of first and second data to first and second storage device interfaces. In addition, amended Claim 1 recites "in a normal operating mode, retrieving said requested one of said first and second data from said first storage device and from said second storage device." Amended Claim 1 further recites that "in said normal operating mode a multiplexer is controlled to connect said first storage device interface to said transport master such that said requested one of said first data and second data from first said first storage device is provided to said transport master for delivery to said host." In addition, Claim 1 recites that, in the normal operating mode, "said multiplexer is controlled to not connect said second storage device interface to said transport master such that said requested one of said first and second data from said second storage device is not provided to said transport master for delivery to said host." Amended Claim 1 further recites that, in a failover mode, "said multiplexer is controlled to connect said second storage device interface to said transport master and such that said requested one of said first and second data from said second storage device is provided to said transport master and said multiplexer is controlled to not connect said first storage device interface to said transport master." Support for the amendments to Claim 1 can be found in the original application, for example in original Claim 2 and in the specification at page 5, lines 7-16, and page 10, lines 5-19.

Application No. 09/904,704

As discussed in detail above, the cited references do not teach, suggest or describe controlling a multiplexer to selectively provide data from a selected one of two storage devices: Furthermore, the cited references do not teach, suggest or describe retrieving requested data from first and second devices simultaneously, and controlling a multiplexer such that only data from one of the selected devices is provided to a host. Accordingly, for at least these reasons, Claim 1 and dependent Claims 3-9 are not obvious in view of the cited references, and the rejections of these Claims should be reconsidered and withdrawn.

Claim 10 is generally directed to a method for storing and retrieving data in a RAID 1 system. Claim 10 further recites storing said data in a first storage device and in a second storage device substantially simultaneously. In addition, amended Claim 10 recites "receiving a request for said first data stored in both said first storage device and said second storage device." Amended Claim 10 additionally recites "in response to said request, retrieving data from said first and second storage devices substantially simultaneously." Claim 10 also recites that the "data retrieved from said first storage device is passed to said transport master, wherein said data retrieved from said second device is passed to said transport slave." Furthermore, Claim 10 recites "validating said first data retrieved from said first and second storage devices to ensure data consistency between said first and second storage devices." Support for the amendments to Claim 10 can be found in the original application, for example in original Claim 14 and in the specification at page 4, lines 13-19.

As described in greater detail above, the cited references do not teach, suggest or describe each and every element recited by amended Claim 10. For example, the cited references do not discuss retrieving data from first and second storage devices in response to a request for such data substantially simultaneously, and in which data retrieved from the first storage device is passed to the transport master and data retrieved from the second storage device has passed to the transport slave. Furthermore, the cited references do not discuss validating the data retrieved from the first and second storage devices to ensure data consistency between them. Accordingly, Claim 10 and dependent Claims 11-13 and 15 are not obvious in view of the cited references, and the rejections of these claims should be reconsidered and withdrawn.

Application No. 09/904,704

Claim 16 is generally directed to a RAID controller. More particularly, Claim 16 recites a transport master, a first device interface interconnected to the transport master, a first storage device directly interconnected to the first device interface, a transport slave, a second device interface interconnected to the transport slave, and a second storage device directly interconnected to this second device interface. As amended, Claim 16 additionally recites a multiplexer. The recited multiplexer includes "a first input interconnected to the first device interface, a second input interconnected to said second device interface, and an output interconnected to the transport master." In addition, amended Claim 16 recites that "the multiplexer selectively interconnects only one of said first and second inputs to said output at any one time, wherein data read from only a selected one of said first and second storage devices is provided to said transport master." Support for the amendments to Claim 16 can be found in the original specification, for example in original Claim 19 and in the specification at page 4, lines 13 through 19.

As set forth in detail above, the cited references do not teach, suggest or describe a RAID controller as recited by amended claim 16. For example, the cited references do not discuss the use of a multiplexer that selectively interconnects one of the first and second device interfaces to a transport master as claimed. In addition, the cited references do not discuss a RAID controller with a multiplexer that can be operated such that only one of first and second storage device interfaces are interconnected to a transport master such that data read from only a selected one of the storage devices is provided to the transport master. Accordingly, for at least these reasons, Claim 16 and dependent Claims 17, 18, 20 and 21 are not obvious in view of the cited references, and the rejections of these claims should be reconsidered and withdrawn.

Application No. 09/904,704

The application now appearing to be in form for allowance, early notification of same is respectfully requested. The Examiner is invited to contact the undersigned by telephone if doing so would expedite the resolution of this case.

Respectfully submitted,

SHERIDAN ROSS P.C.

By: 

Bradley M. Knepper
Registration No. 44,189
1560 Broadway, Suite 1200
Denver, CO 80202-5141
(303) 863-9700

Date: December 21, 2005